UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/008,473	11/09/2001	Robert F. Enenkel	CA920000040US1	5643

46320 7590 01/29/2007

CAREY, RODRIGUEZ, GREENBERG & PAUL, LLP
STEVEN M. GREENBERG
950 PENINSULA CORPORATE CIRCLE
SUITE 3020
BOCA RATON, FL 33487

EXAMINER	
STEVENS, THOMAS H	
ART UNIT	PAPER NUMBER
2121	

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
3 MONTHS	01/29/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

Office Action Summary	Application No.	Applicant(s)	
	10/008,473	ENENKEL ET AL.	
	Examiner	Art Unit	
	Thomas H. Stevens	2121	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *03 November 2006*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-19 and 23-44* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-19 and 23-44* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Section I: Reopening Prosecution

1. In view of the appeal brief filed on 11/03/2006 , PROSECUTION IS HEREBY REOPENED. A new ground of rejection is set forth below.

To avoid abandonment of the application, appellant must exercise one of the following two options: (1) file a reply under 37 CFR 1.111 (if this Office action is non-final) or a reply under 37 CFR 1.113 (if this Office action is final); or,(2) request reinstatement of the appeal.

If reinstatement of the appeal is requested, such request must be accompanied by a supplemental appeal brief, but no new amendments, affidavits (37 CFR 1.130, 1.131 or 1.132) or other evidence are permitted. See 37 CFR 1.193(b)(2). Reopening is necessitated based on applicants' argument in the brief. Based on applicants' brief and interpretation, examiner has provided new art and looks forward to advancing prosecution.

Section II: Non-Final Action

2. Claims 1-19,23-41 were examined.

Claim Rejections - 35 USC § 101

3. 35 U.S.C. 101 reads as follows:

> Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

4. Claims 1-19,23-44 are rejected under 101 since the limitations recite arithmetic operations via a data signals (e.g., claim 1, line 17 and claim 23, line 14) as well as arithmetic equations/functions (e.g., claims 15 and 37 Bessel functions; claims 15-16, 37-38, error functions; claim 33, Homer' Rule).

The following paragraphs are excerpts from patentable subject matter eligibility: If the "acts" of a claimed process manipulate only numbers, abstract concepts or ideas, or signals representing any of the foregoing, the acts are not being applied to appropriate subject matter. Benson, 409 U.S. at 71-72, 175 USPQ at 676. Thus, a process consisting solely of mathematical operations, i.e., converting one set of numbers into another set of numbers, does not manipulate appropriate subject matter and thus cannot constitute a statutory process.

In practical terms, claims define nonstatutory processes if they:
– consist solely of mathematical operations without some claimed practical application (i.e., executing a "mathematical algorithm"); or
– simply manipulate abstract ideas, e.g., a bid (Schrader, 22 F.3d at 293-94, 30 USPQ2d at 1458-59) or a bubble hierarchy (Warmerdam, 33 F.3d at 1360, 31 USPQ2d at 1759), without some claimed practical application.

Thus, a claim that recites a computer that solely calculates a mathematical formula (see Benson) or a computer disk that solely stores a mathematical formula is not directed to the type of subject matter eligible for patent protection.

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

6. The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

7. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

8. Claims 1-4, 8-10, 23, 24, 26, 30, 31,32, 41-44 are rejected under 35 U.S.C. 103 (a) as being unpatented over Bishop, titled, "Modern Control Systems Analysis & Design using MATLAB®" (hereafter Bishop) in view of Kametani (US Patent 4,870,608).

Per claims 1,3,4, 23,25 26 Bishop teaches

- A machine-processing method for computing a property of a mathematically modeled (pg. 17, title) physical system (e.g., fluid flow reservoir, pg. 20)
- input data (pg. 18, 2nd paragraph, bullet point 4)
- outputting, via said machine-processing unit (pg. 18, 2nd paragraph, bullet points 3-6)

but fails to teach polynomials inside a machine-processing unit to which Kametani teaches.

Per claims 1,3,4, 23, 26 Kametani teaches

- reading, via a machine processing unit, (column 4, lines 19-31) including a value for each identified ordered coefficient of a first polynomial p(x) representing said property (column 2, lines 60-65)

- polynomial p(x) being expressed as $p(x) = \text{sum } (Pj \cdot x^j)$ where j=0 to n, a value of a quantity x, a value of a predetermined x_i, and a value of a predetermined $p(x_i)$ correspondingly paired with said predetermined x_i; (Taylor series, column 4, lines 52-66)

- building a value of a second polynomial c(x) having ordered coefficients, (column 4, equation 2) said second polynomial c(x) being expressible as: c(x) = sum ($C_k \cdot x^k$) where k=0 to (n-1) so that said first polynomial p(x) is expressible as: $p(x)=p(x_i)+\{x-x_i\} \cdot c(x)$, (column 5, equation 3)

- determining, a value for each ordered coefficient (column 4, equation 2) of said second polynomial c(x) by generating ordered coefficient of said second polynomial c(x) from: C_k = sum ($P_{(k+l+j)} \cdot x^j_i$) where j=0 to (n-1-k); (column 4, equation 3)

- determining, a value of said second polynomial c(x) ("series of polynomials" column 2, lines 5-10) by generating a plurality of machine processing unit signals to determine: $c(x) = \text{sum}(C_k \cdot x^k)$ (column 4, equation 2) where k=0 to (n-1);

- constructing, a value of said first polynomial p(x) ("series of polynomials" column 2, lines 5-10) by generating a plurality of machine processing unit signals to determine: $p(x)=p(x_i)+\{x- x_i\} \cdot c(x)$; (column 5, lines 15-30) and d) value of the first polynomial p(x) ("series of polynomials" column 2, lines 5-10) said value of the first polynomial as a floating point ("series of polynomials" column 2, lines 5-10) number and the floating point (column 2, line 48)

number is a digital representation (logic circuit, column 6, lines 31-54) of an arbitrary real number

Therefore, at the time of invention it would have been obvious to one of ordinary skill in the art at the time of invention to modify Bishop in view of Kametani to improve the cost-performance (performance/cost) attained in the addition, subtraction, and multiplication operations (Kametani: column 1, lines 45-49).

Per claims 2 and 24, Kametani teaches

- a difference between x and x_i (column 5, equation 3) is sufficiently small to achieve a desired accuracy of a final computation numerical value of said first polynomial p(x) ("series of polynomials" column 2, lines 5-10).

Per claims 8 and 30 Kametani teaches

- e) equating, via said machine-processing unit, a value of a highest ordered coefficient ("series of polynomials" column 2, lines 5-10) of said second polynomial c(x) to a value of an identified highest ordered coefficient of said first polynomial p(x) ("series of polynomials" column 2, lines 5-10) by generating a plurality of machine processing unit signals to determine: $C_{n-1} = P_n$; and

f) a value for each lower ordered coefficient of said second polynomial c(x) ("series of polynomials" column 2, lines 5-10) by generating a plurality of machine processing unit signals (control signals, column 3, lines 10-17) to determine: $C_{k-1}= x_i \cdot C_k+P_k$ where k = (n-1) to 1.

Per claims 9,10 and 31,32 Kametani teaches

- Predetermined x_i is selected from a set of predetermined values ("series of polynomials" column 2, lines 5-10) of x_i
- Predetermined x_i is closest member of said set of identified x ("series of polynomials" column 2, lines 5-10)

Per claims 41 and 42 Kametani teaches

- computer executable instructions ("instruction queue", column 3, 23-32)
- computer processing unit ("control unit" column 3, lines 11-58)
- binary representation (integration of logic gates producing binary outputs, figures 6 and 7 operable with said computer processing unit ("control unit" column 3, lines 11-58)

Per claim 43 Bishop teaches

- mathematical software routine library (pg. 9, figure 1.7, SIMULINK Block Library)

Per claim 44 Bishop teaches

- software routine library (pg. 9, figure 1.7, SIMULINK Block Library)

9. Claims 11 and 33 are rejected under 35 U.S.C. 103(a) as being unpatentable over Bishop in view of Kametani as applied to claims 1, 5, 23,27, and 30 above, and further in view of Gal et al., titled "An Accurate Elementary Mathematical Library for the IEEE Floating Point Standard."

Bishop as modified by Kametani teaches most of the instant application except for Homer's Rule to which Gal teaches.

Per claims 11 and 33, Gal teaches

- second polynomial c(x) is computed by using Homer's Rule (pg. 31, 4th line from the bottom of the page).

Therefore, at the time of invention it would have been obvious to one of ordinary skill in the art at the time of invention to modify Bishop in view of Kametani and in further view of Gal because Gal teaches a method, which controls the error, introduced by the computer representation of real numbers and extend the accuracy with actually using extended precision arithmetic (abstract).

10. Claims 5-7 and 27-29 are rejected under 35 U.S.C. 103(a) as being unpatentable over Bishop in view of Kametani as applied to claims 1, 5, 14, 23,27, and 30 above, and further in view of Ito (US Patent 4,398,263; hereafter Ito)

Bishop as modified by Kametani teaches most of the instant application except for the recurrence expression (forward and backward) to which Ito teaches.

Per claims 5-7 and 27-29 Ito teaches

- recurrence expression (column 12, lines 7-11)
- forward and backward recurrence expression ("recurrence expressions" encompass all expressions, column 12, lines 7-11)

Therefore, at the time of invention it would have been obvious to one of ordinary skill in the art at the time of invention to modify Bishop in view of Kametani and in further view of Ito because Ito teaches a method of performing integrations of high percision with needlessly proglonging the operational time (column 2, lines 24-27).

11. Claims 15-17,37-39 are rejected under 35 U.S.C. 103(a) as being unpatentable over Bishop in view of Kametani as applied to claims 1, 5, 14, 23,27, and 30 above, and further in view of Cody, titled "Performance Evaluation of Programs for the Error and Complementary Error Functions."

Bishop as modified by Kametani teaches most of the instant application except for error and complementary error functions as well as Bessel functions to which Cody teaches.

Per claims 15-17,37-39 Cody teaches

- rational function r(x) is an approximation to an error function (ERF) (pg.30, line 1).
- rational function r(x) is an approximation to a complementary error function (ERFC) (pg.30, line 1).
- rational function is an approximation to a Bessel function (pg. 37, reference 5)

Therefore, at the time of invention it would have been obvious to one of ordinary skill in the art at the time of invention to modify Bishop in view of Kametani and in further view of Cody because Cody teaches a method to test for estimating the accuracy of the function programs and some assessment of their robustness (pg. 29, lines 3-4).

12. Claims 18 and 40 are rejected under 35 U.S.C. 103(a) as being unpatentable over Bishop in view of Kametani as applied to claims 1, 5, 14, 23,27, 30 and 36 above, and further in view of Ng, titled, "A Comparison of Computational Methods and Algorithms for the Complex Gamma Function." (hereafter Ng)

Bishop as modified by Kametani teaches most of the instant application except the log gamma function to which Ng teaches

Per claims 18 and 40, Ng teaches

- wherein said rational function r(x) is an approximation to a log gamma function (LGAMMA) (pg. 56, line 2)

Therefore, at the time of invention it would have been obvious to one of ordinary skill in the art at the time of invention to modify Bishop in view of Kametani and in further view of Ng because Ng teaches a method which helps bring out a high quality algorithm to be recommended either for individual use or for inclusion in program libraries (pg. 56, Introduction, 2nd paragraph, lines 4-7).

13. Claims 12-14, 34-36 are rejected under 35 U.S.C. 103(a) as being unpatentable over Bishop in view of Kametani as applied to claims 1, 5, 14, 23,27, and 30 above, and further in view of Hanselman et al., titled, "The Student Edition of MATLAB version 5 User's Guide." (hereafter Hanselman)

Bishop as modified by Kametani teaches most of the instant application except denominator polynomials to which Hanselman teaches.

Per claims 12-14,34-36 Hanselman teaches

- a value of a denominator polynomial q(x) having identified ordered denominator coefficients, said denominator polynomial q(x) (pg.149, Rational Polynomials) being expressible as: $q(x) = \text{sum}(Q_j \bullet x^j)$ where j=0 to m, (pg.149, Rational Polynomials and pg. 315, summation of a series) h) determining, via said machine processing unit, a value of another polynomial d(x) having ordered denominator coefficients, (pg.149, Rational Polynomials) said another polynomial d(x) being expressible as: $d(x) = \text{sum}\ (D_k \bullet x^k)$ where k = 0 to (m-1) (pg.149, Rational Polynomials and pg. 315, summation of a series) so that said denominator polynomial (pg.149, Rational Polynomials and pg. 315, summation of a series) q(x) is expressible as: $q(x) = q(x_i)+\{x-x_i\} \bullet d(x)$, and a value for the said denominator polynomial is resolved.

- the first polynomial (pg.149, Rational Polynomials) p(x) is a numerator polynomial p(x), (pg.149, Rational Polynomials and pg. 315, summation of a series) and $p(x)-p(x_i)$ is computed, and $p(x_i)$ is not read.

value of a rational function r(x) (pg.149, Rational Polynomials) being expressible as a quotient (multiplication, well known) of said numerator polynomial (pg.149, Rational Polynomials) p(x) and said denominator polynomial q(x) expressed as r(x) = p(x) / q(x), comprising further steps of:

j) constructing, via said machine processing unit, a value of said rational function (pg.149, Rational Polynomials) r(x) by generating a plurality of machine processing unit signals to determine: r(x) = r(xi) ' (I - (q (x)-q (xi))/q(x))) + (p(x) - p(xi))/q(x) (pg.149, Rational Polynomials).

Therefore, at the time of invention it would have been obvious to one of ordinary skill in the art at the time of invention to modify Bishop in view of Kametani and in further view of Hanselman because Hanselman teaches a method that assists anyone to solve many technical computing problems (pg. xvii, 3rd paragraph).

Section III: Response to Arguments

112/101

14. Applicants are thanked for addressing these issues. Rejections are withdrawn.

101

15. Applicants are thanked for addressing these issues. Solving rounding errors inside a computer is a subset of the arithmetic process and not a final specific activity (e.g., to reduce logic gates or calculate lottery numbers). In comparison, the algorithm used in State Street is application specific i.e., final share price, while the application's solution of a floating point number is silent towards a specific activity. The rejection, as stated above, stands.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Mr. Tom Stevens whose telephone number is 571-272-3715, Monday-Friday (7:00 am- 4:30 pm EST).

If attempts to reach the examiner by telephone are unsuccessful, please contact examiner's supervisor Mr. Anthony Knight 571-272-3687. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov.. Answers to questions regarding access to the Private PAIR system, contact the Electronic Business Center (EBC) (toll-free (866-217-9197)).

Anthony Knight
Supervisory Patent Examiner
Tech Center 2100